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EXAMINER

NGUYEN, TU MINH

ART UNIT

PAPER NUMBER

3748

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/552,263

**Applicant(s)**

DUVINAGE ET AL.

**Examiner**

TU M. NGUYEN

**Art Unit**

3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 July 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 15-19 and 25-41 is/are pending in the application.
- 4a) Of the above claim(s) 25-31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 15-19 and 32-41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 October 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB08)
- Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. An Applicant's Request for Continued Examination (RCE) filed on July 1, 2009 has been entered. Per instruction from the RCE, an enclosed Applicant's Amendment has been entered. Claims 20-24 have been canceled; claims 15, 25, 30, 32, and 35 have been amended; and claims 38-41 have been added. Overall, claims 15-19 and 25-41 are pending in this application.
2. Based on a previous applicant's election without traverse of the species of Figure 1, claims 15-19 and 32-41 are readable thereon and will be examined in their full merit. Claims 25-31 are withdrawn from further consideration by the examiner as being drawn to a non-elected invention.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 15, 16, 19, and 32-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stanglmaier et al. (U.S. Patent 6,732,507) in view of Stroia et al. (U.S. Patent 6,745,560) and Liu et al. (U.S. Patent 6,964,156).**

Re claims 15 and 32, as shown in the Figure, Stanglmaier et al. disclose an exhaust gas aftertreatment device for a motor vehicle and a method for operating said device, the device comprising:

- a particulate filter (40) being arranged directly, in a full flow of exhaust gas, in a main exhaust gas stream (16) of an internal combustion engine, whereby residual oxygen that is necessary for combusting particulate matter is derived from exhaust gas;
- an NOx storage catalytic converter (20) arranged in the main exhaust gas stream downstream of the reforming unit, the NOx storage catalytic converter being operable to remove NOx from lean exhaust gas by storing NOx as the lean exhaust gas flows through the NOx storage catalytic converter, and to generate N<sub>2</sub> by reducing the stored NOx when reducing exhaust gas flows through the NOx storage catalytic converter; and
- an SCR catalytic converter (30) arranged in the main exhaust gas stream downstream of the NOx storage catalytic converter, the SCR catalytic converter being operable to reduce NOx contained in the exhaust gas using NH<sub>3</sub> that has been generated by the NOx storage catalytic converter (see lines 29-54 of column 4).

Stanglmaier et al., however, fail to disclose that the particulate filter comprises a reforming unit that generates hydrogen by at least one of steam reforming and partial oxidation of hydrocarbons, whereby hydrogen is used to reduce NOx in exhaust gas by way of the NOx storage catalytic converter; and that an exhaust gas recirculation is arranged downstream of the reforming unit.

As shown in Figure 4, Stroia et al. disclose an adsorber after-treatment system having dual soot filters, comprising a particulate filter (18a) and a NOx storage catalytic converter (26).

As indicated on lines 13-18 of column 8, Stroia et al. teach that it is conventional in the art to include a catalyst in the particulate filter such that the filter is adapted to generate hydrogen from the partial oxidation of a HC fuel, to reduce NOx in an exhaust gas stream by way of the NOx storage catalytic converter. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the particulate filter taught by Stroia et al. in the device and method of Stanglmaier et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to improve a NOx purification efficiency of the NOx storage catalytic converter.

As shown in Figure 1, Liu et al. disclose an intermittent application of syngas to NOx trap and/or to diesel engine, comprising a reformer (30) adapted to generate a reformat enriched with hydrogen for injecting into an exhaust gas path and into the engine. As shown in Figure 1 and 17-37 of column 3, Liu et al. teach that it is conventional in the art to arrange an EGR line (43) downstream of the reformer; and that the reformat is supplied to the engine via the EGR line to improve an engine operation and to reduce harmful emissions in an exhaust gas stream. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Liu et al. in the device and method of Stanglmaier et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to reduce harmful emissions in an exhaust gas stream.

Re claim 16, as shown as device (40) and indicated on lines 15-23 of column 5, the modified device of Stanglmaier et al. further comprises an oxidation catalytic converter that is arranged downstream of the SCR catalytic converter.

Re claim 19, in the modified device of Stanglmaier et al., the reforming unit (40) comprises a catalytically active particulate filter.

Re claims 33-34, as taught by Stroia et al., the modified method of Stanglmaier et al. further comprises setting the temperature of the reforming unit by an air-fuel ratio and determining oxygen concentration in the exhaust gas using a wide-band lambda sensor (20), wherein the reforming unit is operated at an air-fuel ratio in the range from approximately  $0.5 < \lambda < 1.0$ .

Re claims 35-37, as taught by Stroia et al., the modified method of Stanglmaier et al. further comprises setting a quantity of fuel which is fed to the reforming unit via a secondary injection (30) into the exhaust gas stream upstream of the reforming unit.

Re claim 40, in the modified device of Stanglmaier et al., as taught by Stroia et al., the reforming unit is the reforming unit as being configured as an auto-thermal reforming reactor.

Re claim 41, as taught by Stroia et al., the modified device of Stanglmaier et al. further comprises a secondary injection device (30) arranged upstream of the reforming unit being operable for post-engine introduction of reducing agents into the exhaust gas upstream of the reformer.

Re claim 38, the modified device of Stanglmaier et al. discloses the invention as cited above, however, fails to disclose that the device further comprises a catalytic converter arranged closed to the engine.

It is well known to those with ordinary skill in the art that Stanglmaier et al. further comprise a catalytic converter arranged closed to the engine in order to purify exhaust gas when

the engine is during a cold-start period. Therefore, such disclosure by Stanglmaier et al. is notoriously well known in the art so as to be proper for official notice.

Re claim 39, the modified device of Stanglmaier et al. discloses the invention as cited above, however, fails to disclose that the NO<sub>x</sub> storage catalytic converter is configured to generate NH<sub>3</sub> by reduction of accumulated NO<sub>x</sub> with H<sub>2</sub>.

It is well known to those with ordinary skill in the art that the NO<sub>x</sub> storage catalytic converter in Stanglmaier et al. is adapted to generate NH<sub>3</sub> by reduction of accumulated NO<sub>x</sub> with H<sub>2</sub>. Therefore, such disclosure by Stanglmaier et al. is notoriously well known in the art so as to be proper for official notice.

**5. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stanglmaier et al. in view of Stroia et al. and Liu et al. as applied to claims 16 and 15, respectively, above, and further in view of Murachi et al. (U.S. Patent 5,746,989).**

The modified device of Stanglmaier et al. discloses the invention as cited above, however, fails to disclose that the device further comprises a three-way catalytic converter that is arranged immediately downstream of the reforming unit.

As shown in Figure 1, Murachi et al. disclose a system for purifying exhaust gas of an internal combustion engine, comprising a NO<sub>x</sub> storage catalytic converter (9) and a three-way catalytic converter (TWC) located upstream of the NO<sub>x</sub> storage catalytic converter (9). As indicated on lines 7-19 and 37-48 of column 5, Murachi et al. teach that it is conventional in the art to utilize the TWC to convert NO in a lean exhaust gas stream into NO<sub>2</sub> such that NO<sub>2</sub> is further oxidized by the NO<sub>x</sub> catalytic converter into NO<sub>3</sub> which is then adsorbed by the NO<sub>x</sub> catalytic converter. It would have been obvious to one having ordinary skill in the art at the time

of the invention was made, to have utilized the TWC taught by Murachi et al. in the modified device and method of Stanglmaier et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to improve a NO<sub>x</sub> purification efficiency of the NO<sub>x</sub> storage catalytic converter.

***Response to Arguments***

6. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are moot in view of the new ground(s) of rejection.

***Prior Art***

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of three patents: Kinugasa et al. (U.S. Patent 6,047,542), Hu et al. (U.S. Patent 6,254,842), and Hawker (U.S. Patent 7,189,374) further disclose a state of the art.



***Communication***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TMN

July 6, 2009

/Tu M. Nguyen/

Tu M. Nguyen

Primary Examiner

Art Unit 3748